



## Shaft CenterLINES

# Technology transfers from the United States Government



by Donald E. Bently  
Chairman and Chief Executive Officer, Bently Nevada Corporation  
President, Bently Rotor Dynamics Research Corporation

The Federal Government in Washington, D.C. produces a lot of publicity about handing off technology, which was originally developed for military use by U.S. industry. Sometimes, this has been very effective, but at other times it has produced laughable or even harmful results.

The case of "wavelets" is either laughable or harmful, depending on your perspective. Approximately ten years ago, one military agency developed "wavelets," which were invented previously by mathematicians. Since then, in numerous research projects, the government has repeatedly attempted to find some use for wavelets, especially as a tool for observing reciprocating and rotating machinery. It may be that "wavelets" presentation is helpful in heart problem analysis from EKG data, but, there appears to be no particularly useful application for this version of spectrum analysis on machinery. Thus,

interest and effort has been diverted away from more useful possibilities.

NASA's Tech Briefs (January 1996) noted that they are now, "patenting the Keyphasor® technique," which Bently Nevada made commercially successful 26 years ago. It is now the worldwide standard on rotating and reciprocating machinery. However, it has just become "an invention, owned by NASA" with a patent pending. Bently Nevada Corporation and Bently Rotor Dynamics Research Corporation have received many letters from customers joking about this great NASA invention.

Do you remember the early American jingle that goes, "Round and round the

mulberry bush, the monkey chased the weasel. Every time the monkey jumped, pop goes the weasel"? That is a song to the tune of a ten times marker on a spinning wheel, folks. Patent®, anyone?

The really important spectrum tool for observation of rotating machinery in recent years has been the Full Spectrum plots introduced by Bently Nevada. Full Spectrum plots (Figure 2) show both the forward and reverse components of orbits obtained by two orthogonally-mounted transducers, which other spectrum analyzers ignore. This information is extremely useful in rotating and reciprocating machinery diagnostics.

Bently Nevada has provided its customers with facilities for transmission of machinery performance via electronic links to a bulletin board system (BBS). We can and do, with excellent success, transmit pertinent machine train data from the widely-used Bently Nevada ADRE® System (Figure 3) to facilities anywhere in the world. Meanwhile, many research agencies of the U.S. Federal Government spent something like 12 million dollars of our tax money in a two-year contract with would-be competitors and a couple of universities

*Editor's Note: Keyphasor® is a registered trademark of Bently Nevada Corporation. It is a signal used in rotating machinery measurements, generated by a transducer (usually a radially-mounted proximity probe) observing a once-per-turn event on the rotating shaft (Figure 1). A location on the shaft circumference provides the once-per-turn occurrence. It can be a keyway, a hole or slot, a projection, or a change in reflectivity when using an optical transducer.*

*The Keyphasor® signal is used for measuring phase angle, speed, for relating the vibration and rotation frequencies, and as a reference for determination of shaft bow or runout. By providing this information, it is used as a general tool in performing analysis of vibration signals to determine machine malfunctions (e.g. unbalance).*

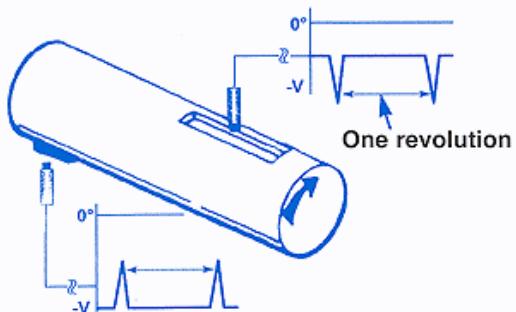


Figure 1

to essentially reinvent this capability. As with the reinvented noncontacting shaft proximity measurement, they did not investigate to see what was already available and successful. I expect that they will extend this research. It would be fun to see what they have accomplished so far, if you aren't concerned about how efficiently your tax dollars are spent.

In the last two years, I have tried hard to get the U.S. Government to support my work on an excellent new contribution to rotor dynamics. The same agencies that are attempting to reinvent our successful devices don't want to support this research. What a pity! No problem, Bently Nevada and its customers can do it without the support of the Federal Government. The only thing that is missing is a powerful military advantage for the next two or three years.

#### ADRE® for Windows

Bently Nevada's ADRE for Windows diagnostic software has become enormously popular among machinery diagnostic specialists, who have seen its impressive value. It is powerful; data from several points can be viewed simultaneously, each in its own "window." It is flexible; data can be viewed in any of several plot formats, so the expert can choose the presentation that best exposes the parameter of interest. It is easy to use. Since it takes advantage of common Microsoft Windows features, users feel comfortable with it immediately. It is portable. With a notebook computer, the system is compact and easy to carry.

#### The most advanced portable diagnostic system available

ADRE for Windows is the tool that Bently Nevada's Machinery Diagnostic Services Engineers prefer to use in the machinery analyses they perform around the world. It is used by Bently Nevada Rotor Dynamics Research Corporation scientists in their investigations into machinery behavior. It incorporates the functions that they, and our customers have suggested. It is the most advanced portable diagnostic system available. Contact your nearest Bently Nevada Sales office for a demonstration. ■

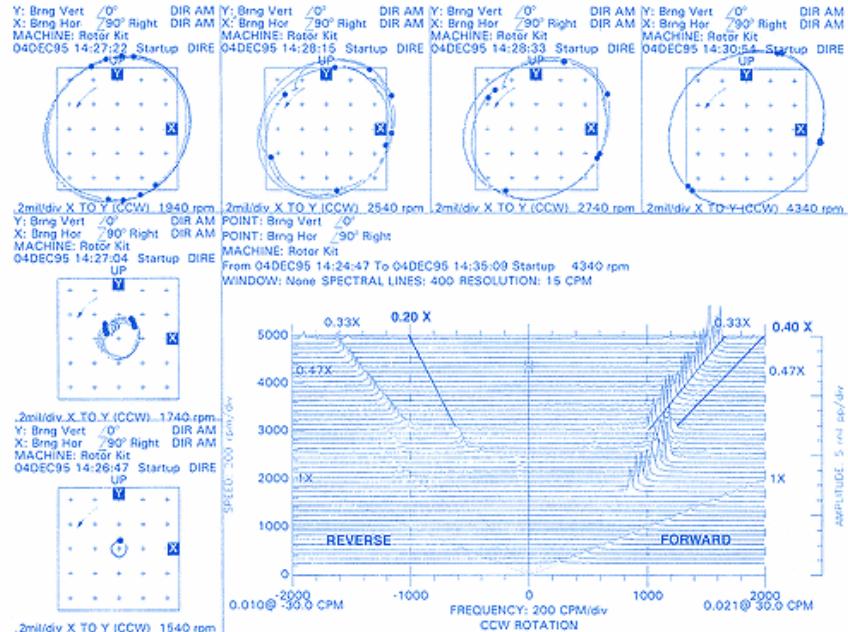


Figure 2  
Full Spectrum Cascade plot and Plus Orbit plots of a machine with a fluid-induced instability and rub during startup.

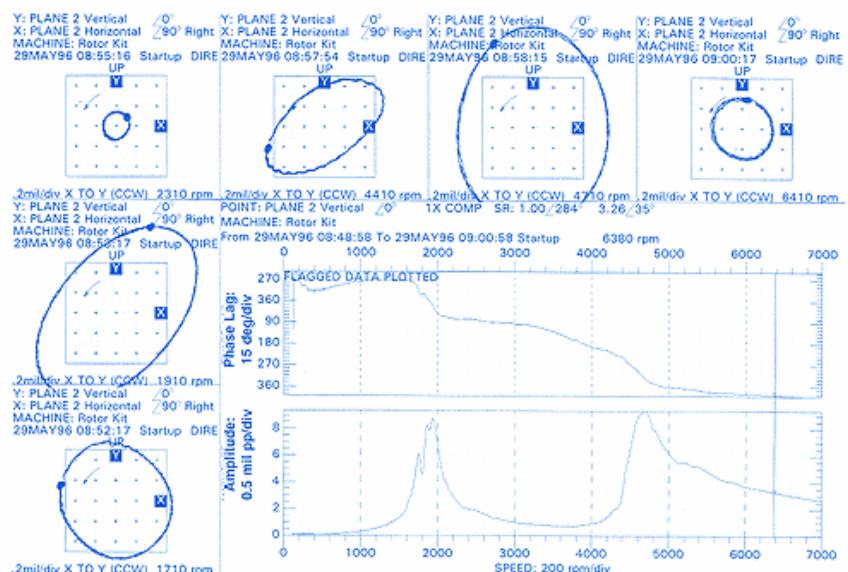


Figure 3  
ADRE® for Windows Bode plot with Plus Orbit plots, showing a two-mode response to unbalance.